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The Use of Lichen to Monitor Semi-volatile Organic Compounds in Sequoia National Park

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Abstract

Lichens have been recognized as early as the 1860s as potential bioindicators of air pollution (1). The Western Airborne Contaminants Assessment Project (WACAP) has been developed to find out what risk is posed to high elevation ecosystems and food webs in the western National Parks from long range transport of airborne contaminants (2). Airborne contaminants can pose threats to wildlife and humans through biomagnification of some compounds that can result in decreased reproductive success, stunted growth, interference with behavior, increased disease, and lower survival rates (2). Biomagnification can result in exposure of subsistence hunters and gatherers to airborne contaminants (2). The contaminants of concern in this study are semivolatile organic compounds (SOCs), which are associated with agriculture, fossil fuel combustion, biomass burning, and industry (3,4). Some of these compounds, including DDT, dieldrin, and heptachlor, have been banned or restricted in the U.S. and Canada, but many SOCs are still being manufactured in North America (4,5). A list of 75 SOCs has been compiled as analytes including, but not limited to, a variety of polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), and polychlorinated biphenyls (PCBs). The site chosen for this research is Sequoia National Park. Samples were collected at 2 sites and extracted using accelerated solvent extraction (ASE). The extract was purified using water liquid-liquid extractions and solid phase extractions, and analyzed using gas chromatography/mass spectrometry. Preliminary results from lichen analysis have shown that a considerable number of pesticides are being deposited in Sequoia National Park and that lichen accumulate a greater number of SOCs than conifer needles for the Emerald Lake study site. This is likely due to the length of exposure.